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Informing the Cooperative Conservation Framework for Improving Watershed Health: Operator and Landowner Survey Results

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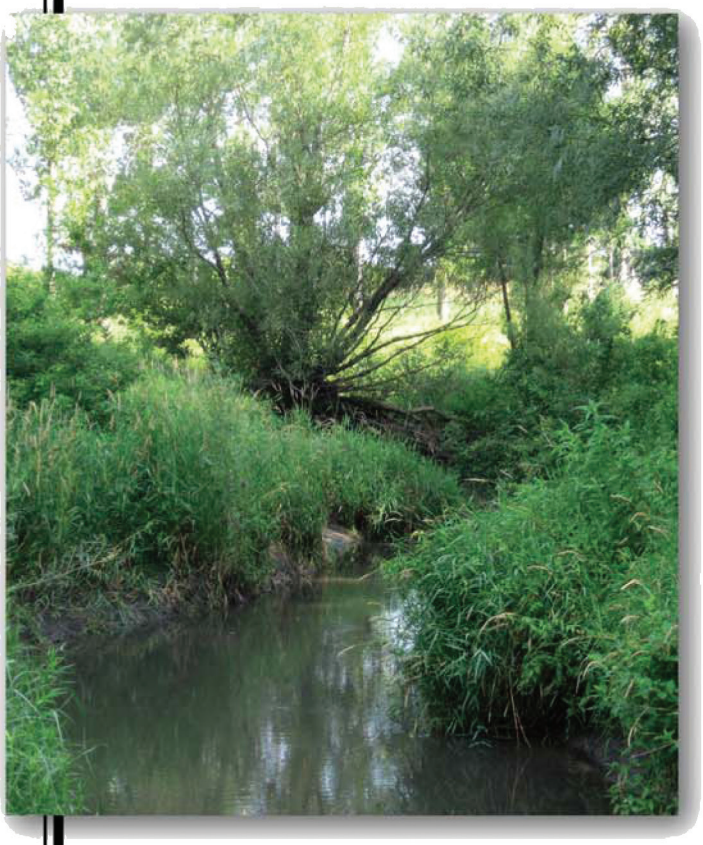
The objective of this study was to provide social, economic, and behavioral data on farm operators and landowners to inform the Iowa Soybean Association's (ISA) effort to develop effective Cooperative Conservation systems in five HUC-12 watersheds in the larger Boone and Raccoon River Watersheds. Three of the watersheds are located in the Boone River watershed: Buck Creek, Lower Eagle, and Lyons Creek. The two watersheds selected from the larger Raccoon River watershed were Fanny's Branch and Willow Creek. A survey titled Watershed Resource Management for Environmental and Economic Performance was sent to all farm operators and non-operator landowners in the watersheds. The data collected through this survey effort and presented in this report represent baseline information that will guide ISA's technical assistance planning and adaptive management processes and facilitate measurement of changes in attitudes, values, and behaviors over time.

Disciplines:
Agricultural and Resource Economics | Community-Based Research | Demography, Population, and Ecology | Rural Sociology



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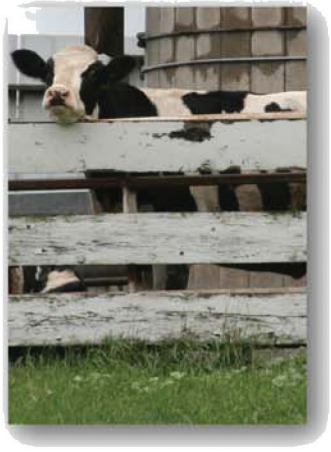

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Introduction

The objective of this study was to provide social, economic, and behavioral data on farm operators and landowners to inform the Iowa Soybean Association's (ISA) effort to develop effective Cooperative Conservation systems in five HUC-12 watersheds in the larger Boone and Raccoon River Watersheds. Three of the watersheds are located in the Boone River watershed: Buck Creek, Lower Eagle, and Lyons Creek. The two watersheds selected from the larger Raccoon River watershed were Fanny's Branch and Willow Creek. A survey titled *Watershed Resource Management for Environmental and Economic Performance* was sent to all farm operators and non-operator landowners in the watersheds. The data collected through this survey effort and presented in this report represent baseline information that will guide ISA's technical assistance planning and adaptive management processes and facilitate measurement of changes in attitudes, values, and behaviors over time.

Survey Development

The survey was designed in collaboration with ISA staff to ensure that their data collection objectives were met. The survey collected data on the following general areas:

Socio-economic characteristics: Data on age, gender, education, life cycle stage, farm income, dependence on farm income, and other key variables.

Farm characteristics and farming practices: Data on owned and rented farmland, crop rotations and acreage planted, numbers and type of livestock, use of fertilizers and manures, and other variables of interest.

Knowledge, beliefs, and concern regarding local environmental conditions: Behavioral change is generally preceded by awareness of a problem. Questions examined levels of knowledge of and concern about environmental issues specific to the project watersheds.

Past and planned conservation behavior: Questions focused on several dimensions of conservation behavior, including 1) conservation practices currently in place 2) conservation practices that respondents believe they should establish, 3) use of management plans (i.e., RMS, nutrient management), and 4) beliefs about the environmental performance of farm operations.

Interest in technical assistance: One of ISA's primary objectives is to provide technical assistance to operators and landowners in the project areas. Survey questions measured potential interest in varied conservation and production-related technical assistance and assessed preferred delivery methods for different categories of technical assistance.

Survey Implementation

Survey implementation consisted of three steps. The first was the development of comprehensive lists of operators and landowners in the study areas. Because the HUC-12 watersheds are relatively small, the entire population of operators and landowners in the five watersheds were surveyed. Iowa Soybean Association staff worked with the USDA Farm Service Agency and the

Natural Resource Conservation Service to develop the lists from the agency databases. The final list contained 769 names and addresses,

The survey was conducted using a modified Dillman Tailored Design Method. A three-step process was followed consisting of 1) a first mailing of the survey and cover letter explaining the purpose of the survey, 2) a reminder postcard sent to non-respondents, and 3) a second mailing of the survey to remaining non-respondents.

Response Rate

Of the 769 surveys that were mailed, 71 were undeliverable, and 179 were completed and returned. As a result, the overall response rate was 26 percent. While this rate of response is lower than what was hoped for, the sample size is large enough to facilitate complex statistical analyses. Nevertheless, because such high rates of nonresponse result in risk of bias due to potential differences between respondents and nonrespondents, caution will be required when generalizing results to the larger population of farm operators and landowners in the watersheds.

Brief Summary of Results

The following section of this report presents a basic tabulation of the data. Several multiple-item question sets employed five-point scales that measured degree of disagreement or agreement, level of importance, level of interest, and so forth. For these questions sets, items are listed in order from strongest response to weakest. This section presents selected findings.

Socio-economic characteristics

- 52 percent were farm operators, 48 percent were non-operator landowners
- Average age was 63 years
- 63 percent had at least some college education

Farm characteristics and farming practices

- 26 percent reported gross farm income over $250,000
- 44 percent reported that over 50 percent of household income came from farming
- 57 percent reported that it is likely or very likely that a child or younger family member will take over management of their land in the future
- Respondents owned an average of 460 acres
- Of the 90 farm operators, 65 rent an average of 925 acres of farmland
- 82 non-operator landowners rented out an average of 196 acres of farmland

Knowledge, beliefs, and concern regarding local environmental conditions

- 86 and 78 percent indicated that they are at least somewhat familiar with the terms “watershed” and “watershed management,” respectively
- More than half did not know if there was an active watershed management group in their watershed
- 18 percent reported that they are involved in organized watershed management activities
- More than 50 percent believe that farmers in the watershed where their farm is located are performing above average on key conservation measures such as reducing soil erosion

- Much higher percentages rate their own performance on those same conservation measures as above average
- Nearly 70 percent were concerned about agriculture's impact on water quality
- Nearly 70 percent agreed that more data should be collected to pinpoint causes of water quality problems
- 52 percent reported uncertainty about the quality of water in their watersheds
- 48 percent agreed that non-farm sources are causing water quality problems
- 25 percent agreed that farming activities are causing water quality problems
- 17 percent agreed that tile drainage is causing water quality problems

Past and planned conservation behavior

- Large percentages had implemented numerous common conservation-oriented practices, such as soil testing (81 percent), grassed waterways (63 percent), and filter strips (56 percent).
- Far fewer saw the need to implement further conservation practices: only integrated pest management (22 percent) was cited by more than twenty percent of respondents as something they should do, but had not done so yet
- Respondents who had made investments in conservation over the previous 10 years cited productivity and profitability concerns among the most important drivers of those investments
- Other motivations for conservation practice establishment, in rough order of importance, included concerns about the environmental performance of operations, policy and regulatory factors, and social pressure

Interest in technical assistance

- The top five areas in which respondents expressed that they were interested or very interested in receiving more information, technical assistance, or other support were soil testing (64 percent), soil erosion control (61 percent), nutrient management (59 percent), energy efficiency (56 percent), and identification of true sources of water quality problems (53 percent)

Watershed Resource Management for Environmental and Economic Performance Survey
Percentage Distribution
(N=179/698, 26 percent response rate)

Response Distribution by Watershed

Buck Creek	17.3%
Fanny's Branch	19.6%
Lower Eagle	37.4%
Lyons Creek	9.5%
Willow Creek	16.2%

WATERSHEDS AND WATERSHED MANAGEMENT

A *watershed* is an area of land—often bordered by high ground such as hills and ridges—that drains into a common waterway or water body. Watersheds are often described as "nested" because smaller watersheds that drain into smaller waterways make up larger watersheds that drain into rivers and ultimately into the sea.

***Watershed management* refers to planning and action focused on maintaining clean water and general environmental quality within a watershed.**

1) Before reading the definitions above, how familiar were you with the following terms?

	Not at all familiar		*Percentage*		Very familiar
Watershed (n=178)	6.7	7.9	24.2	28.7	32.6
Watershed management (n=170)	11.8	10.0	27.1	28.2	22.9

2) Please answer the following questions about the watershed where your farm operation/farmland is located.

	Yes	No	Don't Know
	—Percentage—		
Is there an active watershed management group in the watershed? (n=176)	23.3	26.1	50.6
Are local farmers involved in organized watershed management activities? (n=175)	25.1	24.0	50.9
Are local non-farming residents involved in organized watershed management activities? (n=174)	14.4	25.3	60.3
Are you involved in organized watershed management activities? (n=176)	17.6	75.0	7.4

3) Do any of the following waterways run through or alongside your farm operation/farmland?

	Yes	No	Don't Know
	— Percentage —		
A drainage ditch (n=172)	53.5	43.6	2.9
A stream that starts on or near your land (n=165)	37.0	60.6	2.4
A stream that is formed by two or three smaller streams that come together upstream from your land (n=165)	22.4	72.7	4.8
A large stream that is formed by many smaller streams that come together upstream from your land (n=162)	13.6	80.9	5.6
A river (n=164)	14.0	82.3	3.7

4) On average, how many times per year do you do the following in *streams and rivers* in the watershed where your farm operation/farmland is located? (If none, write "0").

	Number
Swim	n=178 Range = 0-20; $\bar{x}$ = 0.3; Std. Dev. = 1.7
Fish	n=177 Range = 0-100; $\bar{x}$ = 1.2; Std. Dev. = 7.9
Boat	n=178 Range = 0-30; $\bar{x}$ = 0.3; Std. Dev. = 2.4

5) On average, how many times per year do you do the following in *lakes* in the watershed where your farm operation/farmland is located? (If none, please write "0").

	Number
Swim	n=178 Range = 0-5; $\bar{x}$ = 0.1; Std. Dev. = 0.6
Fish	n=177 Range = 0-100; $\bar{x}$ = 0.8; Std. Dev. = 7.6
Boat	n=176 Range = 0-25; $\bar{x}$ = 0.3; Std. Dev. = 2.2

6) Would you eat fish that were caught in waterways or lakes in the watershed where your farm operation/farmland is located?

	Yes	No
	— Percentage —	
Would you eat fish from local streams or rivers? (n=174)	64.4	35.6
Would you eat fish from local lakes? (n=173)	70.5	29.5

7) Thinking generally about farmers in the watershed where your farm operation/farmland is located, how well do you think they are performing in the following areas?

	Very Poorly	Poorly	Average	Well	Very Well	Don't Know
	Percentage					
Maintaining or enhancing soil productivity (n=174)	1.7	1.7	21.8	37.4	25.9	11.5
Reducing runoff of soils and sediments into waterways (n=174)	1.1	6.3	18.4	41.4	19.5	13.2
Improving fertilizer use efficiency (n=171)	0.6	4.1	23.4	33.9	25.1	12.9
Reducing soil erosion (n=172)	1.7	5.2	25.0	36.0	20.9	11.0
Ensuring that overall their farming activities do not harm the environment (n=173)	1.2	7.5	23.7	35.8	16.8	15.0
Reducing flow of nutrients such as nitrogen and phosphorous into waterways (n=175)	0.6	12.6	21.7	32.6	14.9	17.7
Reducing runoff of chemicals such as herbicides, insecticides, and fungicides into waterways (n=173)	1.2	8.7	26.6	30.6	16.2	16.8
Improving soil carbon (organic matter) levels (n=174)	0.6	7.5	26.4	28.7	13.2	23.6
Improving energy efficiency in their operations (n=174)	0.0	6.9	32.2	27.6	13.8	19.5
Providing habitat for game wildlife (n=172)	1.2	14.0	31.4	23.8	16.3	13.4
Providing habitat for non-game wildlife (n=173)	1.7	15.6	34.1	19.1	15.0	14.5

8) Thinking about *your* farm operation or farmland, how well do you think you are performing in these areas?

	Very Poorly	Poorly	Average	Well	Very Well	Don't Know
	Percentage					
Reducing soil erosion (n=175)	0.0	1.7	15.4	38.3	38.9	5.7
Reducing runoff of soils and sediments into waterways (n=173)	0.0	2.3	15.0	38.2	38.2	6.4
Improving fertilizer use efficiency (n=175)	0.0	1.7	15.4	34.9	40.0	8.0
Maintaining or enhancing soil productivity (n=176)	0.0	0.6	18.8	32.4	42.0	6.3
Ensuring that overall farming activities on your land do not harm the environment (n=173)	0.0	0.6	18.3	33.7	38.3	9.1
Reducing flow of chemicals such as herbicides, insecticides, and fungicides into waterways (n=173)	0.0	3.5	16.8	35.8	34.7	9.2
Reducing runoff of nutrients such as nitrogen and phosphorous into waterways (n=173)	0.0	5.2	16.2	37.0	30.1	11.6
Improving energy efficiency in your operations (n=172)	0.0	3.5	20.8	32.4	31.2	12.1
Improving soil carbon (organic matter) levels (n=172)	0.0	2.9	20.9	32.0	26.7	17.4
Providing habitat for game wildlife (n=174)	1.7	6.9	27.0	24.1	31.6	8.6
Providing habitat for non-game wildlife (n=174)	1.7	8.6	28.7	23.0	28.7	9.2

9) Thinking about the watershed where your farm operation/farmland is located, to what extent do you agree or disagree with the following statements?

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
	Percentage				
Farmers and other local residents should work together on water quality issues (n=170)	0.6	1.8	15.9	74.1	7.6
I am concerned about agriculture's impact on water quality (n=174)	3.4	9.2	19.5	58.6	9.2
More data needs to be collected to identify exactly what the major causes (if any) of water quality problems are (n=170)	1.8	10.0	21.8	55.3	11.2
Non-farm sources (municipal wastewater, septic systems, lawn fertilizers) are causing water quality problems (n=174)	4.0	10.9	36.8	42.0	6.3
Water quality in waterways is steadily improving (n=170)	2.4	8.8	45.9	40.0	2.9
Farmers need more help to improve the environmental efficiency of their farms (n=172)	2.3	15.7	40.7	34.3	7.0
Streambank erosion is causing water quality problems (n=171)	9.4	26.3	32.7	26.3	5.3
I would be willing to get more involved in local watershed management efforts (n=170)	7.6	15.9	47.1	27.1	2.4
Water quality in waterways is just fine (n=172)	3.5	16.3	51.7	27.3	1.2
Farming activities are causing water quality problems (n=173)	10.4	30.1	34.1	23.1	2.3
Tile drainage is causing water quality problems (n=173)	12.7	35.3	35.3	15.6	1.2

10) Thinking about the following conservation practices, which practices 1) have you established or employed on your land over the last ten years (since 1999), 2) do you believe you should establish, but have not done so yet, or 3) are not needed on your land?

		Have established	Should establish	Practice not needed
		Percentage		
Soil testing	(n=161)	81.4	11.8	6.8
Yield monitoring	(n=158)	75.9	12.7	11.4
Grassed waterways	(n=164)	62.8	12.2	25.0
Systematic crop scouting	(n=152)	57.2	15.8	27.0
Filter strips (along waterways or water bodies)	(n=162)	56.2	6.8	37.0
Reduced tillage (example: ridge till, no-till)	(n=158)	50.0	17.1	32.9
Drainage water management	(n=149)	43.6	12.8	43.6
Wildlife habitat improvement	(n=159)	39.0	18.2	42.8
Nutrient management plan	(n=158)	37.3	12.7	50.0
Integrated pest management	(n=153)	36.6	21.6	41.8
Windbreak/shelterbelt	(n=159)	30.2	12.6	57.2
Wetland creation/restoration/enhancement	(n=157)	25.5	7.6	66.9
Field border	(n=151)	17.9	9.9	72.2
Streambank stabilization	(n=157)	17.8	18.5	63.7
Cover crops	(n=154)	17.5	9.7	72.7
Terraces	(n=161)	16.1	3.7	80.1
Integration of small grains or forage crops into rotation	(n=153)	15.0	11.1	73.9
Contour buffer strips	(n=159)	14.5	8.2	77.4
Riparian forest buffers (along waterways or water bodies)	(n=159)	14.5	5.7	79.9
Grade stabilization structure (example: pond)	(n=160)	11.9	3.8	84.4
Manure management plan	(n=158)	11.4	2.5	86.1
Water and sediment control basin	(n=158)	10.1	12.0	77.8
Fencing to keep livestock out of streams or wooded areas	(n=161)	8.7	3.1	88.2
Manure pit	(n=162)	6.8	0.0	93.2
Management-intensive rotational grazing	(n=158)	5.7	5.7	88.6
Solid settling basin	(n=156)	3.8	3.2	92.9
Deep-bedded barn	(n=159)	1.3	1.3	97.5
Lagoon	(n=161)	1.2	0.0	98.8

If you did not establish any of the conservation practices listed above since 1999, please skip to question 13

11) What is the approximate total cost of all of the conservation practices that you have established since 1999? Please include all expenses, including those covered by cost-share, loans, or other sources. (Round to the nearest dollar.)

(n=96) Range = $0-$2,000,000; $\bar{x}$ = $48,130.06; Std. Dev. = $211,998.87

12) The following are some reasons why people establish conservation practices. Please rate how important each reason was in your decision to establish conservation practices on your land.

	Not at All Important		*Percentage*		Very Important
Protect the land for the next generation ..... (n=138)	0.7	2.9	5.1	34.1	57.2
Protect my investment in the land..... (n=139)	1.4	1.4	7.2	33.1	56.8
Maintain or improve soil fertility..... (n=136)	0.7	0.7	11.0	37.5	50.0
Maintain or enhance productivity ..... (n=136)	2.9	4.4	8.1	37.5	47.1
Increase long-term profitability ..... (n=133)	3.8	3.0	9.8	39.1	44.4
Avoid polluting streams, rivers and lakes..... (n=136)	1.5	3.7	15.4	39.7	39.7
Reduce the environmental impact of my farming activities..... (n=135)	0.7	3.0	17.0	41.5	37.8
Increase the efficiency of my operation..... (n=136)	2.9	4.4	14.7	34.6	43.4
Keep chemicals and nutrients on the farm ..... (n=136)	1.5	2.9	17.6	43.4	34.6
Protect water quality downstream..... (n=137)	0.0	6.6	20.4	43.1	29.9
Feeling of responsibility to earlier generations.... (n=135)	5.2	5.9	18.5	37.8	32.6
Comply with Farm Bill requirements ..... (n=132)	9.8	12.1	14.4	37.9	25.8
Ensure eligibility for farm bill payments ..... (n=131)	6.9	9.9	20.6	36.6	26.0
Prepare for programs that reward conservation behavior ..... (n=133)	4.5	14.3	21.8	39.8	19.5
Improve habitat for game wildlife ..... (n=135)	2.2	11.9	31.9	32.6	21.5
Increase short-term profitability ..... (n=135)	9.6	13.3	23.7	28.9	24.4
Improve habitat for non-game wildlife..... (n=134)	3.0	11.9	32.8	32.1	20.1
Prepare for potential future regulations ..... (n=132)	8.3	18.9	22.0	34.8	15.9
Avoid problems with regulatory agencies ..... (n=131)	10.7	10.7	29.0	29.0	20.6
I felt embarrassed about a visible problem ..... (n=131)	36.6	20.6	25.2	13.0	4.6
Family member(s) encouraged me to do so..... (n=133)	28.6	28.6	27.8	12.0	3.0
My neighbors were doing it..... (n=133)	38.3	25.6	22.6	12.8	0.8
Neighbors encouraged me to do so..... (n=132)	38.6	34.1	22.0	5.3	0.0

13) The following are areas in which several agencies, organizations, and private companies provide planning, technical assistance, and other services to help landowners to improve the economic and environmental performance of their farmland.

Thinking about your farm operation or farmland, please indicate how interested you would be in receiving *more* information, technical assistance, or other support in the following areas.

	Not at All Interested	Somewhat Interested	Interested	Very Interested	Uncertain
			Percentage		
Soil testing (n=152)	19.7	14.5	31.6	32.2	2.0
Soil erosion control (n=154)	16.9	18.8	31.8	29.2	3.2
Nutrient management (n=147)	23.8	16.3	34.0	24.5	1.4
Energy efficiency (n=151)	23.2	17.9	31.8	23.8	3.3
Identification of true sources of water quality problems in your watershed (n=150)	22.7	20.7	29.3	24.0	3.3
Pest management (n=148)	21.6	23.3	32.4	20.3	2.7
Tillage and residue management (n=149)	24.8	26.2	32.2	15.4	1.3
Assessment of overall environmental performance of your farm (n=151)	23.8	26.5	25.2	21.2	3.3
Stalk sampling (n=149)	30.2	22.1	30.9	14.8	2.0
Water sampling and monitoring (n=150)	30.0	22.7	26.0	18.7	2.7
Wildlife habitat improvement (n=151)	25.8	27.2	30.5	13.9	2.6
Controlled drainage (n=148)	29.1	26.4	27.0	15.5	2.0
Assessment of overall environmental performance of all activities in watersheds (n=151)	23.2	32.5	22.5	17.2	4.6
Waste management (trash, used oil, hazardous materials) (n=148)	31.8	25.0	29.7	8.1	5.4
Legal/regulatory requirement review (n=147)	36.1	21.8	29.3	7.5	5.4
Carbon sequestration/greenhouse gas management (n=148)	37.8	20.3	23.0	13.5	5.4
Whole-farm resource management (n=145)	39.3	20.7	25.5	10.3	4.1
Streambank stabilization (n=149)	45.6	20.8	20.1	10.1	3.4
Construction of nutrient removal wetlands (n=146)	42.5	25.3	18.5	7.5	6.2
Facilitation of citizen-led watershed management planning and action (n=144)	50.7	20.8	19.4	5.6	3.5
Odor management (n=151)	54.3	16.6	17.9	6.6	4.6
Manure management (n=150)	59.3	14.0	15.3	8.7	2.7
Septic system evaluation (n=154)	53.2	22.1	15.6	5.2	3.9
Construction of bioreactors (n=150)	52.0	18.0	14.7	6.0	9.3
Grazing management (n=151)	69.5	11.3	9.9	5.3	4.0

14) Considering the following categories of assistance, please select the means of providing information and technical assistance that you believe would be *most appropriate* for each of the following areas.

	One-on-one consultation	Workshops and group meetings	Demonstrations/ Field days	Mailings	Internet websites and email
	Percentage				
Soil erosion control ..... (n=144)	24.3	17.4	19.4	27.8	11.1
Water quality improvement..... (n=140)	11.4	30.0	15.0	30.0	13.6
Pest management..... (n=138)	10.9	29.0	14.5	31.9	13.8
Soil fertility improvement ..... (n=140)	20.7	20.7	16.4	27.9	14.3
Nutrient or manure management ..... (n=133)	14.3	27.8	15.0	26.3	16.5
Wildlife habitat improvement ..... (n=139)	14.4	20.1	18.0	33.1	14.4

GENERAL QUESTIONS

15) How many years has the farmland that your family has *owned the longest* been in the family?

(n=171) Range = 5-154 years; $\bar{x}$ = 75.6 years; Std. Dev. = 35.1 years

16) When you retire from farming or are no longer managing your land, how likely is it that one of your children or a younger family member (in-law, nephew, niece) will take over? (n=174)

33.3% Very likely
24.1% Likely
18.4% Unlikely
24.1% Very unlikely

17) Are you a… (n=175)

77.1% Male
22.9% Female

18) What is your age?

(n=171) Range = 23-95 years; $\bar{x}$ = 63.1 years; Std. Dev. = 13.3 years

19) What is the highest level of education you have completed? (n=174)

2.9% Some high school
26.4% High school graduate
8.0% Technical/vocational school
20.1% Some college
27.6% Bachelor's degree
5.2% Some graduate school
9.8% Graduate or professional degree

FARM CHARACTERISTICS

20) How many acres of farmland do you own?

(n=172) Range = 0-8,400 acres; $\bar{x}$ = 460.2 acres; Std. Dev. = 1,116.1 acres

21) How many acres of farmland did you rent or lease *from* others in 2009? (if none, please write "0")

(n=166) Range = 0-3,500 acres; $\bar{x}$ = 372.8 acres; Std. Dev. = 657.6 acres

22) How many acres of farmland did you rent or lease *to* others in 2009? (if none, please write "0")

(n=169) Range = 0-4,313 acres; $\bar{x}$ = 186.1 acres; Std. Dev. = 518.6 acres

23) Which category best represents your *gross* farm income for 2008? (n=152)

0.7%	Less than $2,500
5.9%	$2,500 to $9,999
11.8%	$10,000 to $24,999
23.7%	$25,000 to $49,999
15.1%	$50,000 to $99,999
17.1%	$100,000 to $249,999
11.2%	$250,000 to $499,999
14.5%	$500,000 or more

24) What percent of your 2008 net household income was from your farm operation or farmland? (n=160)

13.8%	0% to 10%
21.9%	11% to 25%
20.6%	26% to 50%
17.5%	51% to 75%
26.3%	76% to 100%

25) Are you a: (n=174)

48.3%	Non-operator farmland owner	***Thank you for your participation. You are finished with the survey.***
51.7%	Farm operator	***Please go to Q26***

26) Please indicate the number of acres of your land or land that you rented from someone else that are in the following crops/uses in 2009.

	Owned	Rented
Corn	(n=62) Range = 26-8,000; $\bar{x}$ = 373.4; Std. Dev. = 1,016.2	(n=63) Range = 30-2,200; $\bar{x}$ = 501.8; Std. Dev. = 468.9
Soybeans	(n=56) Range = 20-1,000; $\bar{x}$ = 191.1; Std. Dev. = 183.1	(n=58) Range = 15-1,800; $\bar{x}$ = 403.0; Std. Dev. = 350.2
Wheat	(n=0)	(n=0)
Oats	(n=0)	(n=0)
Sorghum	(n=0)	(n=0)
Hay or pasture	(n=8) Range = 1-35; $\bar{x}$ = 16.9; Std. Dev. = 10.7	(n=9) Range = 2-110; $\bar{x}$ = 26.8 Std. Dev. = 34.4
Vegetables or fruit	(n=0)	(n=0)
Conservation Reserve (CRP) ground	(n=17) Range = 3-106; $\bar{x}$ = 31.2; Std. Dev. = 35.3	(n=19) Range = 1-80; $\bar{x}$ = 16.6; Std. Dev. = 18.4
Other	(n=5) Range = 10-30; $\bar{x}$ = 16.8; Std. Dev. = 8.3	(n=1) $\bar{x}$ = 2

27) Please indicate the number of animals currently in your farm operation or on your land.

	Owned by You	Owned by Others
Beef cow-calf pairs	(n=9) Range = 3-170; $\bar{x}$ = 34.6; Std. Dev. = 52.5	(n=4) Range = 5-50; $\bar{x}$ = 18.2; Std. Dev. = 21.3
Cattle on feed	(n=5) Range = 4-850; $\bar{x}$ = 214.2; Std. Dev. = 357.6	(n=1) $\bar{x}$ = 1,600
Dairy cattle	(n=0)	(n=0)
Breeding hogs	(n=3) Range = 1-180; $\bar{x}$ = 62.3; Std. Dev. = 101.9	(n=0)
Market hogs, including feeder pigs	(n=3) Range = 300-1,500; $\bar{x}$ = 725.0; Std. Dev. = 672.2	(n=6) Range = 400-13,000; $\bar{x}$ = 3,850.0; Std. Dev. = 4,768.1
Laying hens and pullets	(n=1) $\bar{x}$ = 12	(n=0)
Broilers and other chickens	(n=0)	(n=0)
Turkeys	(n=1) $\bar{x}$ = 9	(n=0)
Other	(n=1) $\bar{x}$ = 14	(n=1) $\bar{x}$ = 100

FERTILIZER USE AND MANURE MANAGEMENT

28) In the last five years, have you made any regular reductions in the amount of nitrogen you apply to your cropland? (n=99)

59.6%	Yes	***Please continue to Question 29***
33.3%	No	***Please continue to Question 30***
7.1%	Don't know	***Please continue to Question 30***

29) If yes, why have you reduced the amount of nitrogen you apply? (n=59 for each statement)

% ✓'ed	
89.8	To reduce costs
52.5	Following new recommendations
27.1	Credit taken from manure/legumes
27.1	Concern over groundwater pollution
8.5	Concern over health effects
18.6	Concern over surface water pollution
16.9	Want my farm to become more sustainable

30) To what extent do you use the following practices to manage nitrogen?

	Do Not Use	Limited Use	Moderate Use	Heavy Use
	Percentage			
Crop rotations (n=94)	3.2	5.3	35.1	56.4
Soil testing (n=94)	9.6	9.6	48.9	31.9
Yield goals (n=93)	11.8	7.5	43.0	37.6
Variable fertilizer rates (n=92)	32.6	19.6	28.3	19.6
Animal manure (n=95)	49.5	10.5	25.3	14.7
Soil temperatures (n=90)	50.0	14.4	20.0	15.6
Plant legumes (n=92)	51.1	17.4	22.8	8.7
N-Serve or N-Stabilizer (n=91)	52.7	16.5	18.7	12.1
Controlled drainage (n=91)	59.3	11.0	22.0	7.7
Integrated Crop Management (ICM) (n=89)	46.1	24.7	25.8	3.4
Test strips (n=89)	55.2	20.2	18.0	5.6
Aerial photos or remote sensing (n=91)	74.7	8.8	11.0	5.5
Stalk N tests (n=88)	67.0	18.2	12.5	2.3
Late spring nitrogen test (n=88)	69.3	18.2	10.2	2.3
Wetlands (n=92)	72.8	17.4	6.5	3.3
SPAD (chlorophyll) meter (n=89)	94.4	3.4	2.2	0.0

31) Please indicate the number of acres that received the following forms of fertilizer and application rates over the 2008-2009 season (If none, write "0").

	Number of Acres	Application Rates	
Anhydrous Ammonia	(n=78) Range = 0-6,000; $\bar{x}$ = 463.9; Std. Dev. = 811.4	(n=62) Range = 0-300; $\bar{x}$ = 106.3; Std. Dev. = 68.0	lbs. N/acre
Liquid Nitrogen	(n=74) Range = 0-3,200; $\bar{x}$ = 296.2; Std. Dev. = 499.3	(n=55) Range = 0-180; $\bar{x}$ = 75.6; Std. Dev. = 62.8	lbs. N/acre
Dry (granular) Nitrogen	(n=64) Range = 0-1,700; $\bar{x}$ = 201.0; Std. Dev. = 361.1	(n=45) Range = 0-200; $\bar{x}$ = 23.9; Std. Dev. = 39.0	lbs. N/acre
Phosphorus	(n=68) Range = 0-8,000; $\bar{x}$ = 509.5; Std. Dev. = 1,055.3	(n=44) Range = 0-180; $\bar{x}$ = 56.4; Std. Dev. = 50.9	lbs. P/acre
Solid manure	(n=68) Range = 0-677; $\bar{x}$ = 86.4; Std. Dev. = 167.2	(n=48) Range = 0-3; $\bar{x}$ = 0.8; Std. Dev. = 1.1	Tons/acre
Liquid manure	(n=66) Range = 0-1,200; $\bar{x}$ = 65.9; Std. Dev. = 205.5	(n=44) Range = 0-20,000; $\bar{x}$ = 1,157.7; Std. Dev. = 3,361.0	Gallons/acre

32) Do you apply manure on your cropland? (n=101)

No	62.4%	***Thank you for your participation. You are finished with the survey***
Yes	37.6%	Go to question 33

33) Do you regularly apply manure prior to planting the following crops?

	Yes	No
	Percentage	
Corn (n=48)	75.0	25.0
Soybeans (n=44)	15.9	84.1
Alfalfa (n=41)	4.9	95.1
Small grain (n=40)	0.0	100.0
Other (n=37)	2.7	97.3

34) Please answer the following questions about manure management and application.

	Yes	No
	Percentage	
Have you tested manure for its nitrogen/phosphorus nutrient availability? (n=46)	65.2	34.8
Do you adjust commercial nitrogen rates to reflect the contribution from manure? (n=46)	76.1	23.9
Do you adjust commercial phosphorus rates to reflect the contribution from manure? (n=46)	69.6	30.4

35) How do you decide where to apply manure? (n=59 for each statement)

% ✓'ed	
15.3	According to my manure management plan
20.3	Systematically rotate applications depending upon soil nutrient needs
6.8	Apply mostly in fields near my livestock facilities
8.5	Apply manure evenly in most or all of my fields
3.4	Apply in most convenient locations
27.1	Apply according to schedule that involves rotation of fields
6.8	Consultant's recommendation

Thank you for your participation. Your input will help to improve outreach and extension support for Iowa farmers and landowners. Please return the survey in the envelope provided at your earliest convenience.